Republic of Lithuania

NATIONAL ASSESSMENT REPORT
TOPICAL PEER REVIEW
AGEING MANAGEMENT

Report prepared following the outcomes of the first Topical Peer Review on ageing management

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This report is prepared by the State Nuclear Power Safety Inspectorate (VATESI).

All information and data used in the Lithuanian National Report are as of July 1st, 2020 unless explicitly specified otherwise.

Content

1. General information

Lithuania has prepared the National assessment report (NAR) following the outcomes of the first Topical Peer Review (TPR) on ageing management, organised by ENSREG in the countries of the Europe Union. In the Final Report on the first Topical Peer Review[1] it is recommended *„that countries explore the regulation and implementation of Ageing Management Programmes of other risk significant nuclear installations"*. Taking into account the provision of the Technical Specification for the National Assessment Reports[2] Lithuania previously did not submitted a report for the first TPR, as far as no operating reactors or research reactors are located in Lithuania.

This report provides a description concerning assurance of effective ageing management through all lifetime of nuclear installations.

Nuclear safety regulatory authority

The State Nuclear Power Safety Inspectorate (VATESI) regulates nuclear and radiation safety as well as security at nuclear power and radioactive waste management facilities; transportation safety and security of nuclear and nuclear fuel cycle materials; safety and security of activities involving sources of ionizing radiation in the area of nuclear energy; and non-proliferation issues concerning nuclear weapons.

License holder

All nuclear installations in Lithuania are operated by the State Enterprise Ignalina Nuclear Power Plant, which performs works for decommissioning of Ignalina NPP, including unloading of spent nuclear fuel from NPP units and transfer to the spent nuclear fuel storage facility, decontamination and dismantling of equipment and buildings, treatment and storage of radioactive waste.

1.1. Nuclear installations

1.1.1. Description of the nuclear installations included in the assessment

Lithuania has one nuclear power plant, Ignalina NPP with two RMBK-1500 units, both of them are in permanent shutdown: Unit-1 – from 2004 and Unit-2 – from 2009. Unit-1 and Unit-2 reactors are fully defueled, a part of fuel is still located in spent fuel pools. Both units will remain under operation license at the spent fuel pools defueling stage until the complete fuel removal from the units. License holder is planning to finish defueling of both units' spent fuel pools until 2022.

Other main nuclear installations are:

[1] http://ensreg.eu/sites/default/files/attachments/hlg_p2018-37_160_1st_topical_peer_review_report_2.pdf
[2] http://ensreg.eu/sites/default/files/attachments/wenra_tpr_technical_specification_-_january_2017_1.pdf

- **Spent fuel storage facility (SNFSF-1) -** contains 98 CONSTOR RBMK-1500 type and 20 CASTOR RBMK containers. This facility is fully loaded;
- **Interim spent fuel storage facility (SNFSF-2) -** put in operation in 2017 and will contain about 190 CONSTOR RBMK-1500/M2 type containers. The spent fuel from Ignalina NPP Units will be transferred to the storage facility up to 2022;
- **Cemented waste storage facility.** In 2006 VATESI issued a license to Ignalina NPP for operation of storage facility for cemented spent ion-exchange resins, filter aid (perlite) and part of evaporator concentrate with solid particle sediments;
- **Bituminised waste storage facility** was put in operation in 1987. Storage Facility is designed for acceptance and storage of bituminised short-lived low and intermediate level radioactive waste. The potential conversion of the existing bituminized waste storage facility into a final repository is under investigation. This study should be completed in 2027;
- **Solid radioactive waste retrieval facilities (project B2) –** these facilities are dedicated for retrieval of the Ignalina NPP operational waste from the old storage facilities (buildings 155, 155/1, 157, 157/1) and characterization of very low-level radioactive waste. For retrieval facilities from 155 and 155/1 buildings a permit for industrial operation was issued in 2019. For retrieval facilities from 157 and 157/1 buildings, the "hot trials" started in 2017 and completed in 2020. About 27 000 m^3 of waste have to be retrieved and most will be sent to new solid radioactive waste management and storage facilities (project B3/4);
- **Solid radioactive waste management and storage facilities (project B3/4)** – about 128 000 m^3 of solid radioactive operational and decommissioning waste will be reprocessed and located in new solid radioactive waste management facilities. The planned capacity of the storage facility for short-lived radioactive waste is about 2500 m^3 and for long-lived radioactive waste is about 2000 m^3. These storage facilities could be extended if necessary. The operational license was issued in 2017 and "hot trials" of facilities are ongoing and should be completed in 2020;
- **Very low-level radioactive waste storage facility (project B19-1)** – this facility started industrial operation in 2013. The load capacity of this buffer storage is 4000 m^3. Radioactive waste will be transferred from this facility into very low-level radioactive waste disposal facility approximately every 2 years;
- **Very low-level radioactive waste disposal facility (project B19-2)** – in 2015 VATESI issued a license to construct and operate a very low level radioactive waste disposal facility. Capacity of very low level radioactive waste disposal will be 60 000 m^3. Planned start of operation is in 2021;
- **Low and intermediate level short-lived radioactive waste disposal facility (project B25)** – in 2017 VATESI issued a license to construct and operate a low and intermediate level short-

lived radioactive waste disposal facility. Capacity of low and intermediate level radioactive waste disposal facility will be 100 000 m^3. Planned start of operation is in 2023;

- **Maišiagala "Radon" type waste storage facility** was closed in 1989. This storage was designed for institutional waste disposal with the volume about 200 m^3. Licensing process of decommissioning of Maišiagala Radioactive Waste Storage Facility is ongoing. According to the decommissioning plan, radioactive waste stored in Maišiagala facility will be sorted and shipped to the Ignalina NPP radioactive waste treatment and storage facilities. It is planned to decommission Maišiagala facility until 2023.

1.2. Process to develop the national assessment report

The NAR was prepared by VATESI using available information and proposals have been provided by the license holder – State Enterprise Ignalina Nuclear Power Plant.

2. Overall ageing management programme requirements and implementation

2.1. National legislative and regulatory framework

Nuclear Safety Requirements BSR-1.8.4-2018 "Ageing Management Requirements of Structures, Systems and Components Important to Safety of Nuclear Facilities" impose the general requirements on license holder related to the management of ageing of SSCs and presents the regulatory oversight relevant to the license holder duties. These requirements are applied to a whole lifetime cycle of nuclear installations and SSCs important to safety. These requirements aim at ensuring both short and long-term operability and technological conformance of SSC important to safety.

The specific provisions on ageing management are provided in VATESI regulations:

- Nuclear Safety Requirements BSR-2.1.2-2010 „General Requirements on Assurance of Safety of Nuclear Power Plants with RBMK-1500 Type Reactors";
- Nuclear Safety Requirements BSR-3.1.1-2016 „General Requirements for Spent Nuclear Fuel Storage Facility of the Dry Type";
- Nuclear Safety Requirements BSR-3.1.2-2017 „Pre-disposal Management of Radioactive Waste at the Nuclear Facilities";
- Nuclear Safety Requirements BSR-3.1.2-2017 „Pre-disposal Management of Radioactive Waste at the Nuclear Facilities";
- Nuclear Safety Requirements BSR-1.8.6-2019 „Maintenance, Surveillance and In-service Inspection of Structures, Systems and Components Important to Safety of Nuclear Facility" stipulate, that the design, construction, operation, condition monitoring and maintenance of nuclear

facilities shall provide for the ageing of systems, structures and components (SSCs) important to safety in order to ensure that they meet the design-basis requirements with necessary safety margins throughout the lifetime of the facility.

Furthermore, the systematic procedures shall be in place for preventing such ageing effects of SSC, which may deteriorate their operability, and for the early detection of the need for their maintenance, modification or replacement. Safety requirements and applicability of new technologies are to be assessed periodically in order to ensure that the technology applied is up to date, and the availability of the spare parts and the system support shall be monitored. Ageing issues are subject of periodic safety review in accordance with the Law on Nuclear Safety and VATESI's regulations. There is established the requirement that effects of ageing on SSCs important to safety among other factors shall be taken into account when their performance of their safety functions is assessed.

2.2. International standards

Guidelines which are adapted to maintenance strategies and ageing management practices to an extent which has been deemed appropriate to ensure operability of SSCs important to safety at nuclear facilities:

- Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants, IAEA specific safety guide No. SSG-48;
- Data Collection and Record Keeping for the Management of Nuclear Power Plant Ageing, IAEA Safety Series No. 50-P-3, (1991);
- Methodology for the Management of Aging of Nuclear Power Plant Components Important to Safety, Technical Reports Series, No. 338, IAEA, Vienna (1992);
- Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants, IAEA Safety Guide No. NS-G-2.6;
- Periodic Safety Review of Nuclear Power Plants, IAEA Safety Guide No. SSG-25, IAEA;
- A system for the Feedback of Experience from Events in Nuclear Installations, IAEA Safety Guide No. NS-G-2.11;
- WENRA Safety Reference Levels for Existing Reactors, Issue I: Ageing Management.

2.3. Description of the overall Ageing Management Programme

2.3.1. Scope of the overall Ageing Management Programme

The Ignalina NPP (license holder) has established and maintained ageing management programme (AMP) according to Nuclear Safety Requirements BSR-1.8.4-2018 "Ageing

Management Requirements of Structures, Systems and Components Important to Safety of Nuclear Facilities". This AMP covered all nuclear facilities operated by Ignalina NPP (license holder).

Ignalina NPP has prepared and maintained:

- procedure and programme for the SSC ageing management;
- methodology for assessment of the technical conditions and remaining life time of the SSC;
- procedure for screening of SSC for the purpose of ageing management;
- list of the Ignalina NPP SSCs important to safety;
- schedule of evaluation of the technical conditions and remaining lifetime of SSC, which are included in AMP.

Procedure and Programme of Ignalina NPP for the SSC ageing management describe all these topics:

- policy, criteria and objectives of ageing management;
- organizational arrangements;
- data collection and record keeping;
- screening of SSCs for the purposes of ageing management;
- review of the management of ageing;
- condition assessment;
- development of ageing management programmes and plan of its performance;
- improvement of ageing management programmes.

The main task of the AMP is to timely identify and mitigate the ageing process impact to SSCs of nuclear installations with the aim to ensure reliable operation of prescribed functions, nuclear and radiation safety and economic efficiency during the period whole operation cycle of nuclear installations including decommissioning. The Ignalina NPP prepared AMP ensures performance of following functions:

- general assessment of ageing processes according design documentation requirements;
- timely assessment of systems and components condition to ensure reliable operation of nuclear installations during design lifetime;
- timely detection of systems and components degradation phenomena, including determination of unanticipated causes, their elimination and mitigation of consequences;
- performance of necessary modifications and change of operation conditions in order to mitigate degradation phenomena;
- assessment of residual service life of SSC and planning of necessary measures;
- data collection and record keeping system.

This programme will be applied as long as particular SSCs of the Ignalina NPP are required to remain operating and the decommissioning process has not been completed for the existing NPP units, also this programme is applied for recently constructed pre-disposal management of radioactive waste at the nuclear facilities, spent fuel and radioactive waste storages.

2.3.2. Ageing assessment of systems, structures and components

Ignalina NPP has the list of SSCs important to safety for the purposes of ageing management. The SSC included in the list belong to safety categories of 2 and 3 (there are no SSCs which belong to category 1).

These SSCs important to safety for the purposes of ageing management are grouped, taking into account equipment type, materials, service conditions and degradation in the „Methodology for assessment of the technical conditions and remaining life time of the SSCs".

The SSCs of safety categories of 2 and 3 are grouped in these main groups:

– fittings;

– pumps;

– vessels and containers;

– cables;

– concrete structures;

– hoisting equipment;

– structures and components of solid radioactive waste management and storage facilities.

There are attached ageing mechanisms, typical controlled parameters of ageing for each group of SSCs, also data evaluation techniques for recognizing significant degradation and for predicting future performance of SSCs.

2.3.3. Monitoring, testing, sampling and inspection activities

Control, monitoring and ageing management includes tests and calibration, checks and monitoring, supervision, observations, detection of deficiency, assessments of operability, check-in of defects and data of operation and maintenance.

Periodic inspections (all SSCs)

Periodic inspections are performed by license holder according with regulatory requirements or according with Ignalina NPP' programme for maintenance, surveillance and in-service inspection of SSCs. These periodic inspections cover:

– pumps;

– vessels and containers;

– cables;

– hoisting equipment;

– fire protection equipment;

– concrete structures.

Regular walk-downs

In addition, inspections are made during regular walk-downs by operational personnel according to a check list. These inspections typically include visual inspections for leakages, checks for abnormal noises, vibration, lubricant level checks and other.

Online monitoring (mechanical components)

Online monitoring covers SSCs for which continuous monitoring is considered necessary for predictive maintenance**.** The continuously monitored parameters are recorded and analysed in the data processing systems. The results are used to assess condition and performance of a SSC concerned, and if major changes are observed, the future maintenance activities have to be scheduled.

2.3.4. Preventive and remedial actions

The license holder has programme in place defining the condition monitoring and maintenance of SSC including schedules for the actions to be taken. Any need for maintenance or repair of SSCs shall be reliably detectable by means of condition risk to nuclear and radiation safety. Condition monitoring is typically based on visual inspections, non-destructive testing, functional tests and pressure and leak tightness tests. Condition monitoring is also considered to include actions that provide information about parameters that are related to the SSC operability or have an effect on it such as cumulative fatigue, hydrochemistry parameters and material surveillance. When a SSC is refurbished or repaired, the license holder has to investigate whether the same degradation could be found in other similar SSCs at his facilities (a common cause failure). Moreover, that the license holder has to investigate how the degradation could be avoided in the future by improving the condition monitoring or maintenance of the SSCs and also included of spare part availability management.

The condition monitoring and maintenance programmes and instructions pertaining to a SSC are be based on the applicable standards, manufacturer’s recommendations or the operating experience feedback received in-house or from other nuclear facilities. The aim is that these programmes and instructions are unambiguously and clearly familiarized to the operation and maintenance staff.

2.4. Review and update of the overall AMP

The license holder reviews and assesses the effectiveness of their overall AMP on a regular basis. The input for the assessment is typically gathered from the following sources:

– condition monitoring of SSC such as in-service inspections and tests;

– scheduled and unscheduled maintenance of SSC;

– evaluation of plant specific and others' operating experiences;

– evaluation of ageing analyses that are time limited;

– R&D results when applicable;

– regulator's feedback.

Whenever the assessment indicates weaknesses or impaired performance, for example in terms of increasing failure frequency of a SSC, the AMP strategy and modification for that particular SSC is reconsidered.

The license holder reviews and assesses the list of SSCs, whose ageing needs to be managed and makes alterations of it, when they are needed.

2.5. Licensee's experience of application of the overall AMP

Ignalina NPP way to manage any technical problem is to consider some corrective actions. Idea of Ignalina NPP's AMP is by inspecting, testing or monitoring SCCs to find out deficiencies. Corrective actions have to be started if a deficiency is indicated. This is a normal action to modify periodic or preventive maintenance or change the action itself.

2.6. Regulatory oversight process

VATESI oversight of ageing in nuclear installations focuses on review AMP along with operating license applications and periodic safety reviews where the conformance to the relevant VATESI regulations, including experience in licensee's recent ageing management, is reviewed.

VATESI reviews the overall AMP when the licensee applies for an operating license. The assessment of ageing management issues is also integrated into the regulatory assessment of Periodic Safety Review report, which shall be presented every tenth year.

VATESI, as part of its review and inspection programme, ensures that the Ignalina NPP collects required baseline data and confirms that critical service conditions (as used in equipment qualification) are in compliance with the design analyses. For these purposes, the periodic inspections are performed on nuclear installations site according to annual planning and they tackle both the organizational issues and technical aspects of each discipline. Within the periodic inspection programme there are several dedicated inspections, which exclusively concentrates on the condition

monitoring, maintenance activities and ageing management. The aim of theses inspections is to evaluate and verify the procedures the license holder has for ensuring reliable integrity and performance of SSCs.

The license holder submits to the VATESI for review, assessment and approval the list of SSCs whose ageing needs to be managed and the alterations of it, when they were made.

VATESI also assesses the implementation of the AMP based on the follow-up reports prepared annually by the license holders. An expert responsible for oversighting of AMP implementation and VATESI inspectors responsible for supervision of SCCs are appointed to oversee how the license holder performs his duties in the ageing management of SSCs. The major tasks is to evaluate AMPs and annual follow-up reports. If shortcomings are found, for example in attending to the maintenance of a SSC in the long term, the licensee is called for further clarifications or possible corrective actions.

2.7. Regulator's assessment of the overall ageing management programme and conclusions

Ignalina NNP has established the ageing management programme in which:

- all significant ageing mechanisms for each SSC important to safety shall be identified;
- there is a thorough understanding of the relevant ageing mechanisms and their effects;
- the ageing behaviour of SSCs over the period of operation to date is consistent with predictions;
- there are adequate margins in respect of ageing to ensure safe operation for at least the period until the next periodic safety review.

The Ignalina NPP (license holder) has an effective AMP in place for all nuclear installations.

Effective ageing management is in practice accomplished by coordinating existing programmes, including maintenance, in-service inspection and surveillance, as well as operations, technical support programmes (including analysis of any ageing mechanisms).

3. Overall assessment and general conclusions

It can be concluded that AMP is active, regular and effective, including all the methods for assurance of effective ageing management and covering all appropriate actions, such as: supervision, maintenance, monitoring and the use of operational experience. AMP is directed to support the necessary safety margins of SSCs through all lifetime of nuclear installations. AMP is intended to help ensure that required technical conditions of SSC is maintained and in place for future nuclear installations' operation.